Special Article

CONCERNING THE SIZE OF WOMEN

PRELIMINARY NOTE WITH SPECIAL REFERENCE TO HEIGHT

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A popular belief seems to be prevalent that women are increasing in size. This idea has, apparently, received some confirmation from the study of 4023 of the Stanford women who entered the University during the past thirty years.

This study has been limited to the entrance physical examinations, thus minimizing the influence of the college work; the number of graduate students included in these cases is probably too small to have had any great amount of influence. Thus this group of women is more nearly a fair sample of the population at large rather than of the more limited class who have the benefit of university training. Every available physical examination has been used which gave age, weight, and height of the women at their entrance physical examinations.

The romantic story of the founding of Stanford University gave its opening in 1891 a very wide publicity and attracted, not only students from California and the neighboring states, but also from the middle west and from the far east, both north and south. Only fourteen of the thirty years thus far have been analyzed with reference to the birthplace of the students. The curves for the Californians and non-Californians both show the upward trend of weight and height and the downward trend of the age curves.

The grouping of these cases in four age periods does not obliterate these curves, but shows the same general directions. The accuracy of these results is still further augmented by the fact that the investigator made the physical examinations in 1893, 4 and 5; from 1911 to 1918; and part of the examinations in 1910, 1919, and 1920-21. These years contain 1945 of the total 4023 cases included in this study, and are distributed in the first and second decades as well as in the last. Certain of the remaining records were made by examiners trained by the investigator, thus minimizing the element of error introduced by the personal equation in measuring. The curve constructed from the writer's own measurements shows the same upward trend for height as in the curve based on all of the cases for the thirty years.

The examinations are always made during all hours of the working day, and are usually concentrated in the first days of the opening of the semester or quarter. Thus it would seem fair to disregard the diurnal changes as having any very material influence on the results.

A statistical study has been made of the probable errors of the average heights for the years 1891-2, 1893-4, 1916-17, 1917-18, and the probable errors in the differences of the averages for 1891-2 compared with 1917-18 and for 1893-4 compared with 1916-17. All of the measurements of this last pair were made by the writer. This study shows that the average heights are based upon series which more than satisfy statistical requirements, and that the differences in heights in the contrasted pairs is so many times greater than the probable error of the differences as to afford statistical assurance of validity.

TABLE I. AVERAGE HEIGHT OF 4023 UNIVERSITY WOMEN IN YEAR GROUPS, 1891-2 to 1920-21 INCLUSIVE

University Year	No. of Cases	Average Height in Inches
1891-2	94	62.4
1892-3	91	63.2
1893-4	89	63.0
1894-5	124	63.3
1895-6	108	63.2
1896-7	127	63.4
1897-8	124	63.2
1898-9	124	63.2
1899-1900	117	63.5
1900-1	118	63.3
1901-2	104	63.8
1902-3	150	63.8
1903-4	102	64.7
1904-5	39	63.5
1905-6	78	63.6
1906-7	158	63.8
1907-8	180	63.6
1908-9	63	63.5
1909-10	133	63.9
1910-11	193	63.5
1911-12	131	63.7
1912-13	91	63.7
1913-14	146	63.7
1914-15	168	64.0
1915-16	178	63.7
1916-17	170	64.0
1917-18	238	64.1
1918-19	276	63.8
1919-20	157	63.6
1920-21	152	63.9*

*Examinations of women entering during the first and second quarters only.

TABLE II. AVERAGE HEIGHT OF 4023 UNIVERSITY WOMEN BY 10-YEAR PERIODS. (FROM TABLE I).

Years in 10-Year Periods	No. of Cases	Average Height in Inches.
1891-2 to 1900-1 (Inclusive)	1116	63.2
1901-2 to 1910-11 (Inclusive)	1200	63.5*
1911-12 to 1920-21 (Inclusive)	1707	63.8

*The average for 1903-4, which is obviously in error, is not included in this average of the second 10-year period. If this figure is included the average height for the second decade becomes 63.8, the same as the average for the third period.

To be well within the limits of safety we may disregard the average height for the first recorded year, since the abrupt change (62.4) for 1891-2 to the average for the succeeding years is so great as to excite some suspicion of its accuracy, especially as we have no data showing the relation of this low average to the averages of the years preceding.

We may, therefore, conclude, pending further investigation, that, as illustrated by the changes recorded in 4023 women entering Stanford University during the past thirty years, that the average height of the women of today has increased from one to one and one-tenth inches.

There is also a definite increase in the average weight. The detailed data of this part of the investigation will be presented in a later paper, together with the evidence which shows that this increase in weight and height has occurred in spite of the fact that the average age of the women entering the University has grown less. The racial as well as economic importance of these changes, which point to a more fully developed and more perfectly functioning type of woman, can hardly be overestimated.

RELATIONSHIP BETWEEN TRAUMA AND MALIGNANT DISEASE FROM AN INDUSTRIAL VIEWPOINT

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Before entering upon a discussion of the relationship of trauma to malignant disease from the point of view of one who wishes to determine fairly the connection of an industrial accident with the subsequent development of a malignant growth, it may be well to look upon the question from a purely scientific standpoint and to ask ourselves what warrant is there to assume, that there may be such a connection.

It is common knowledge, that our information in regard to the etiology of tumor is woefully deficient. What the final cause of them is, if there is any single such, we do not know, but we are gradually learning to connect up the development of tumors with other types of proliferative processes of which we have a better understanding; may they be due to abnormalities in development, to inflammation, or may they be connected with the more normal processes of hypertrophy and regeneration. The general impression is, that any change which is associated with tissue proliferation may terminate in the development of true tumor. Other things being equal this transformation occurs the more readily the more actively the tissues are proliferating and the longer the tissue proliferation has continued. It is also evident that this transformation is fortunately a rare occurrence. Pathological tissue proliferations due to one cause or another are exceedingly common. There is hardly any human being, or any living organism for that matter exempt from them, but tumors we meet with only occasionally. It is this which has made many investigators feel, that something new must happen to convert these ordinary tissue proliferations into tumorous growths, but on close analysis may we not find, that the difference is merely a quantitative not a qualitative one, i. e., that after all the same process continues only in a vastly exaggerated form in a more or less predisposed individual? The existence of intermediate stages, where even the best expert with all modern technical means at his disposal cannot decide whether they should be classified as tumors or whether they still belong to the other pathological conditions mentioned seems to point this way.

From these theoretical conditions it will be evident that trauma can contribute to the development of tumors in so far as it causes tissue proliferation and, since any break in continuity, such as is likely to occur as a result of the trauma, is sure to be followed by regenerative and often by inflammatory proliferative processes, the possibility certainly exists that these may go on to the development of true tumors.

It would also appear, as if repeated and continued traumatic influences would be more likely to terminate in tumor production than a single trauma followed by a reaction of limited duration, and this surmise is amply born out by practical experience. The most numerous and best authenticated cases of post-traumatic tumor formation belong to this group. To mention but one example; so many cases of carcinoma arising in scars or chronic ulcers from old burns have been reported in literature, that there cannot any more be a question of the etiological relation of the one to the other, and the same is true, as we all know, of other types of chronic ulcerations of the skin and mucous membranes in the production and maintenance of which trauma may play an important role.

The relation of single trauma to tumor is much more doubtful, and it is quite generally stated that there is no case so far recorded in literature which proves this connection with scientific accuracy, but that there is sufficient evidence to make it justifiable to give to patients for whom the question of insurance depends on our decision, the benefit of the doubt.

It is interesting to follow the development of our knowledge in this field and to notice how gradually the circumstances under which such a connection is assumed have become more and more restricted, and our attitude toward the question more and more conservative.

Samuel Gross [1] in 1897 made the statement, that among the 144 cases of sarcoma of the long bones which he had been studying one-half of those in which the etiology was recorded were due to traumatism. They could be traced to blows, falls, kicks, sprains, fractures and other injuries.

A thorough discussion of the problem commences with an elaborate paper of Loewenthal,[2] from Bollinger's laboratory in Munich in 1875 which includes the presentation of 800 short case-records without much critical analysis of them, however. For this reason the majority of them are worthless from a scientific point of view, but at the same time he reports a considerable number of very interesting and suggestive observations as, for instance, several cases in which sarcoma developed at the site of old fractures and in old gun-shot wounds.

Coley [3] follows in 1898 with an article on the influence of injury upon the development of sarcoma. He studied 70 cases of sarcoma among which there was a history of trauma in 46 (27%). A careful analysis of the records of the 46 cases shows, that not more than one-half of them are fairly convincing. Coley develops the idea; that the trauma localizes the unknown cause of cancer as it is apt to do in infectious diseases like tuberculosis.

Another extensive, rather early publication (1906) on our subject is that of Roepke [4] who